RESISTORS

- Metal Film Resistor (MF Type)
- Metal Film Resistor (FMF Flame Proof Type)
- Metal Oxide Film Resistor (MO Type)
- Carbon Film Resistor (R Type)
- Carbon Film Resistor (FR Flame Proof Type)
- Thick Film Resistor Networks (SIP Type)
- High-Meg Ohm Cermet Glaze Resistor (HMG Type)
- Temperature Sensing Resistor (TSR Type)
- Chip Resistor (CR Type)
- Micro Resistor (MR Type)
- Wirewound Resistor (SQ Rectangular Type)
- Wirewound Resistor (KNP Flame Proof Type)
- Wirewound Resistor (SQZ PCB Mounting Type)
- Wirewound Resistor (SQH Clamp Mounting Type)
- Zero-Ohm Jumper Wire
- Conversion Table mm-inches
- Taping Specification
- Packing Specification
- Color Code Chart

ROBERT G. ALLEN COMPANY, INC.
CAPACITORS & RESISTORS

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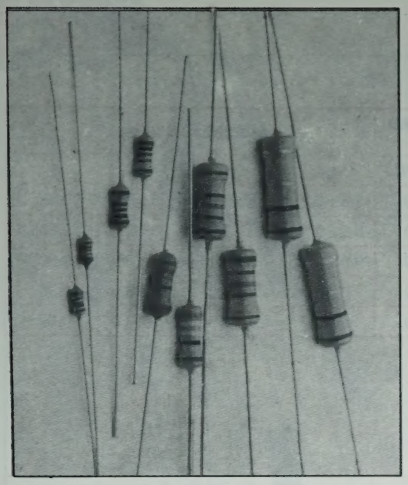


METAL FILM FIXED RESISTORS

TYPE
MF08, MF25
MF50, MF100, MF200

ELECTRICAL SPECIFICATIONS

All measurements are taken at +25°C at 1 KHz and 65% relative humidity, unless otherwise stated.

INTRODUCTION

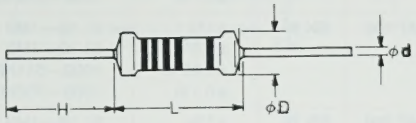
The MF series Metal Film Resistors are manufactured using vacuum sputtering system to deposit multiple layers of mixed metals and passive materials onto a carefully treated high grade ceramic substrate, the resistors are coated with layers of light-blue lacquer.

The MF series emcompasses an unusually broad selection of power ratings (1/8W, 1/4W, 1/2W, 1W, 2W, at 70°C), tolerance (±0.1%, 0.25%, 0.5%, 1%) and temperature coefficient (±15PPM/°C, 25PPM/°C, 50PPM/°C, 100PPM/°C), in all their combinations with full MIL-R-10509 performance.

FEATURES

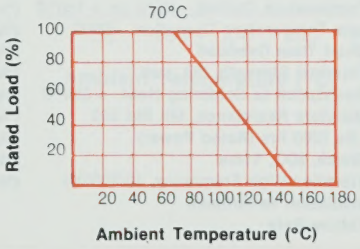
DIN STYLE:
DIN-44061
0204, 0207, 0309, 0411, 0617
MIL STYLE:
MIL-R-10509F (Char. D & C)
RN-50, RN-55, RN-60, RN-65, RN-70
POWER RATING:
1/8W, 1/4W, 1/2W, 1W, 2W (at 70°C)
1/20W, 1/10W, 1/8W, 1/4W, 1/2W (at 125°C)
RESISTANCE TOLERANCE:
± 0.1% ±0.25%, ±0.5%, ±1%
TEMP. COEFFICIENT:
±15PPM/°C, ±25PPM/°C, ±50PPM/°C, ±100PPM/°C

DIMENSIONS



POWER DERATING CURVE

For resistor operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



GENERAL SPECIFICATIONS

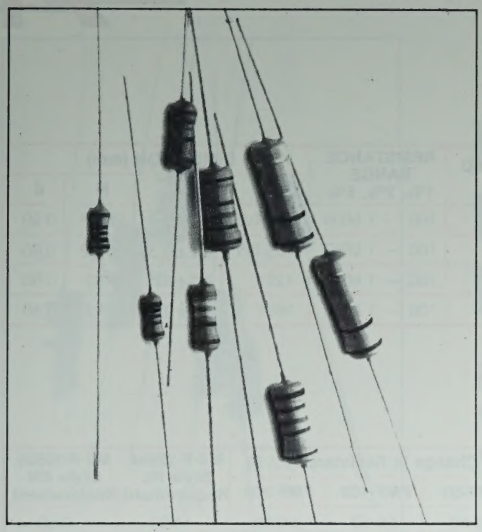
STYLE	MIL STYLE	POWER RATING (W)		MAX WORKING VOLTAGE		MAX OVERLOAD VOLTAGE		DIMENSION (mm)			
		70°C	125°C	70°C	125°C	70°C	125°C	L	D	H	d
MF 08	RN 50	0.125W	0.05W	200	150	400	300	3.8±0.2	1.5±0.2	28±2.0	0.45
MF 25	RN 55	0.25W	0.1W	250	200	500	400	6.5±0.5	2.3±0.3	28±2.0	0.60
MF 50	RN 60	0.5W	0.125W	350	250	700	500	9.5±0.5	3.2±0.5	28±2.0	0.60
MF 100	RN 65	1W	0.25W	500	300	1000	600	12±1.0	4.5±0.5	37±3.0	0.80
MF 200	RN 70	2W	0.5W	500	350	1000	700	16±1.0	5.5±0.5	37±3.0	0.80

RESISTANCE RANGE

STYLE	MIL STYLE	TOLERANCE	TC + 15PPM 25PPM	TC +50PPM	TC +100PPM	REMARK
MF 08	RN 50	±1% ±0.5% ±0.25%	100Ω—100KΩ 100Ω—100KΩ 100Ω—100KΩ	51.1Ω—200KΩ 51.1Ω—200KΩ 51.1Ω—200KΩ	51.1Ω—511KΩ 51.1Ω—511KΩ 51.1Ω—511KΩ	
MF 25	RN 55	±1% ±0.5% ±0.25% ±0.1%	51.1Ω—511KΩ 51.1Ω—511KΩ 100Ω—330KΩ 100Ω—100KΩ	10Ω—1MΩ 10Ω—1MΩ 51.1Ω—330KΩ 100Ω—100KΩ	5.11Ω—2.4MΩ* 5.11Ω—2.4MΩ*	
MF 50	RN 60	±1% ±0.5% ±0.25% ±0.1%	51.1Ω—1MΩ 51.1Ω—1MΩ 100Ω—511KΩ 100Ω—330KΩ	10Ω—2.2MΩ 10Ω—1MΩ 51.1Ω—511KΩ 100Ω—330KΩ	5.11Ω—2.4MΩ* 5.11Ω—2.4MΩ*	*Standard resistance is 10Ω—1MΩ, below or over this resistance on request.
MF 100	RN 65	±1% ±0.5% ±0.25% ±0.1%	51.1Ω—1MΩ 51.1Ω—1MΩ 100Ω—511KΩ 100Ω—330KΩ	5.11Ω—1.0MΩ 5.11Ω—1MΩ 51.1Ω—511KΩ 100Ω—330KΩ	5.11Ω—2.4MΩ* 5.11Ω—2.4MΩ*	
MF 200	RN 70	±1% ±0.5% ±0.25% ±0.1%	51.1Ω—1MΩ 51.1Ω—1MΩ 100Ω—511KΩ 100Ω—330KΩ	10Ω—2.2MΩ 10Ω—1MΩ 51.1Ω—511KΩ 100Ω—330KΩ	5.11Ω—5.11MΩ* 5.11Ω—5.11MΩ*	

PERFORMANCE SPECIFICATIONS COMPARISON

TEST	MF Series % Change in Resistance (△R)					Mil-R-22684 Style RL Requirement	Mil-R-10509 Chart C, E Requirement
	MF 08	MF 25	MF 50	MF 100	MF 200		
1. Temperature Cycling, -65°C to +150°C (%)	±0.25	±0.25	±0.25	±0.25	±0.25	≤1.00	≤0.25
2. Low Temperature Operation, -65°C (%)	±0.25	±0.25	±0.25	±0.25	±0.25	≤0.50	≤0.25
3. Short Time Overload (%)	±0.25	±0.20	±0.20	±0.25	±0.20	≤0.50	≤0.25
4. Terminal Strength, 5lb. pull (%)	±0.20	±0.20	±0.20	±0.15	±0.15	≤0.50	≤0.20
5. Resistance to Soldering Heat, +350°C (%)	±0.10	±0.10	±0.10	±0.10	±0.10	≤0.50	≤0.10
6. Moisture Resistance, Mil Std 202 (%)	±0.50	±0.50	±0.50	±0.50	±0.50	≤1.50	≤0.50
7. Life 1000 hrs (Rated Power) (%)	±0.50	±0.50	±0.50	±0.50	±0.50	≤2.00	≤0.50
8. Shock, 50G, 11ms (%)	±0.25	±0.20	±0.20	±0.15	±0.15	≤0.50	≤0.25
9. Vibration-High Frequency, 10-2000Hz (%)	±0.25	±0.20	±0.20	±0.20	±0.20	≤0.50	≤0.25
10. Insulation Resistance	$\geq 10^{10}\Omega$	$\geq 10^{10}\Omega$	$\geq 10^{10}\Omega$	$\geq 10^{10}\Omega$	$\geq 10^{10}\Omega$	$\geq 10^{9}\Omega$	$\geq 10^{9}\Omega$
11. Failure-Rate	$<10^{-9}$/h	$<10^{-9}$/h	$<10^{-9}$/h	$<10^{-9}$/h	$<10^{-9}$/h		



METAL FILM FIXED RESISTOR

FLAME-PROOF TYPE

FMF 25, FMF 50
FMF 100, FMF 200

INTRODUCTION

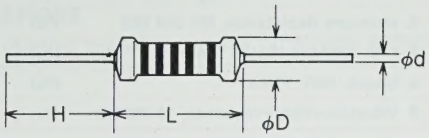
The FMF series flame-proof type Metal Film Resistors are manufactured by vacuum deposit metal film on high thermal conductivity ceramic rods, and are coated with layers of light-blue color flame-proof lacquer, these resistors meet overload tests in accordance with UL specification #1412 without producing a fire hazard. (UL-1412 is the standard for fusing resistors and temperature-limited resistors)

These FMF flame-proof metal film resistor is designed to replace the metal oxide resistors and low power wire wound resistors, where when flame-proof and small size is needed.

FEATURE

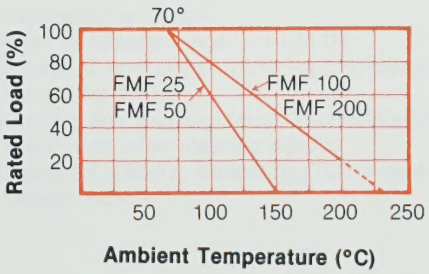
Flame-Proof Coating.....UL-1412
Power Rating.....1/4W, 1/2W, 1W, 2W
Resistance Tolerance.....±1%, ±2%, ±5%
TCR.....±50PPM, ±100PPM

DIMENSIONS



POWER DERATING CURVE

For resistor operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.

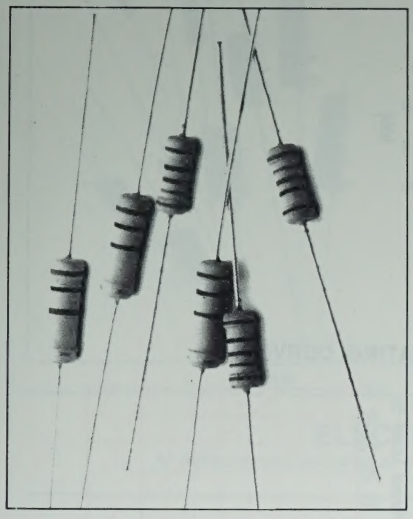


GENERAL SPECIFICATIONS

STYLE	POWER RATING (70°C)	MAX WORKING VOLTAGE	MAX OVERLOAD VOLTAGE	RESISTANCE RANGE 1%, 2%, 5%	DIMENSION (mm)			
					L	D	H	d
FMF 25	1/4W	250	500	10Ω — 1 MEG	6.5±0.5	2.3±0.3	28±2	0.60
FMF 50	1/2W	350	700	10Ω — 1 MEG	9.5±0.5	3.2±0.3	28±2	0.60
FMF 100	1W	500	1000	10Ω — 1 MEG	12±1	4.5±0.5	37±3	0.80
FMF 200	2W	500	1000	10Ω — 1 MEG	16±1	5.0±0.5	37±3	0.80

PERFORMANCE SPECIFICATIONS COMPARISON

TEST	FMF Series % Change in Resistance (△R)				Mil-R-22684 Style RL Requirement	Mil-R-10509 Style RN Requirement
	FMF-25	FMF-50	FMF-100	FMF-200		
1. Temperature Cycling, -65°C to +150°C (%)	±0.50	±0.50	±0.50	±0.50	1.00	0.50
2. Low Temperature Operation, -65°C (%)	±0.50	±0.50	±0.50	±0.50	0.50	0.50
3. Short Time Overload (%)	±0.25	±0.25	±0.25	±0.25	0.50	0.50
4. Terminal Strength, 5lb. pull (%)	±0.20	±0.20	±0.20	±0.20	0.50	0.20
5. Resistance to Soldering Heat, +350°C (%)	±0.10	±0.10	±0.10	±0.10	0.50	0.50
6. Moisture Resistance, Mil Std 202 (%)	±1.00	±1.00	±1.00	±1.00	1.50	1.50
7. Life 1000 hrs (Rated Power) (%)	±1.00	±1.00	±1.00	±1.00	2.00	1.00
8. Shock, 50G, 11ms (%)	±0.25	±0.25	±0.25	±0.25	0.50	0.50
9. Vibration-High Frequency, 10-2000Hz (%)	±0.25	±0.25	±0.25	±0.25	0.50	0.50



METAL OXIDE FILM RESISTORS

FLAME-PROOF TYPE
M01, M02, M03
M04, M05, M07

ELECTRICAL SPECIFICATIONS

All measurements are taken at +25°C at 1 KHz and 65% relative humidity, unless otherwise stated.

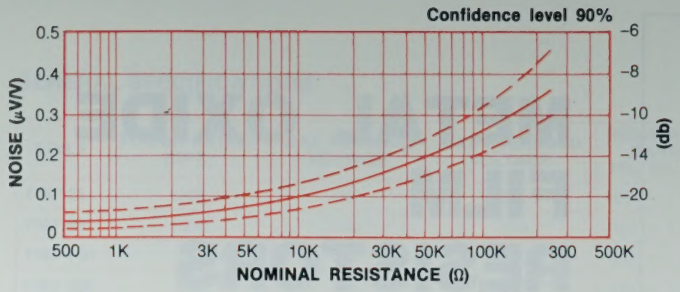
DESCRIPTIONS

These Metal Oxide Resistors offer excellent performance in applications where stability and uniformity of characteristics are desired. They provide lower cost alternatives to Carbon Composition Resistors and General Purpose Metal Films. Metal Oxides also can replace many low power General Purpose wirewound applications, saving both money and time, with shorter delivery cycles. These Metal Oxides meet overload tests in accordance with UL specification #1412 without producing a fire hazard. (UL 1412 is the standard for fusing resistors and temperature-limited resistors). These Metal Oxides withstand solvents test in accordance with article Mil-Std-202E without producing mechanical or electrical damage.

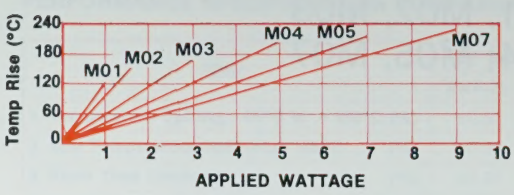
FEATURES

- Low cost, prompt delivery
- High power-to-size ratio for significant space savings
- Excellent long-term stability
- Complete flameproof construction
- High surge/overload capability
- Controlled temperature coefficient
- Non-Inductive design
- Wide resistance range: 0.1Ω to 1M
- Standard tolerance: ±2%, ±5% (consult factory for 1%)
- Coating and marking resist Trichlorethelyne, Freon, and other cleaning agents
- Improved stability, dissipation, TCR available. Consult factory

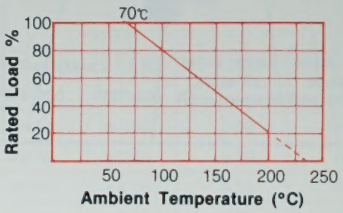
CURRENT NOISE



TEMPERATURE RISE



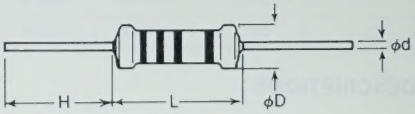
DERATING CORVE



CHARACTERISTIC

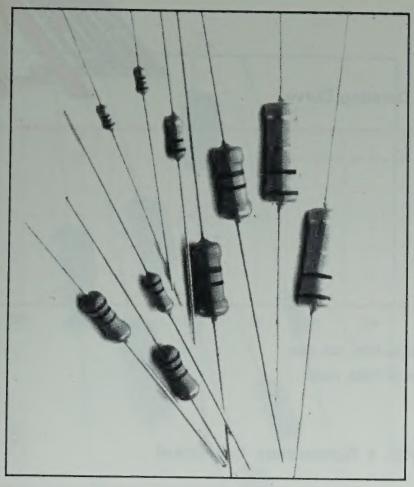
Temperature Coefficient	±200 PPM Typ, ±350 Max
Insulation Resistance	10,000 MΩ Min
Load Life (1,000 hours)	< 1% Typ, ±3% Max
Short-time Overload	±0.5% Max
Temperature Cycling	±1.0% Max
Moisture Resistance	±1.0% Max
Shock and Vibration	±0.2% Max
Effect of Soldering	±0.5% Max
Voltage Coefficient	.001%/V
Current Noise	< .1μV/V

DIMENSIONS



GENERAL SPECIFICATION

TYPE	DIMENSION (mm)				POWER RATING	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	RESISTANCE RANGE
	L	D	H	d				2%, 5%, 10%
M01	12±1	4.5±0.5	37±3	0.8	1W	350V	600	0.1Ω–1MΩ
M02	16±1	5.5±0.5	37±3	0.8	2W	350V	600	0.1Ω–1MΩ
M03	26±1	8.5±1.0	38±3	0.8	3W	500V	800	0.1Ω–1MΩ
M04	33±1	8.5±1.0	38±3	0.8	4W	500V	800	0.1Ω–1MΩ
M05	41±1	8.5±1.0	38±3	0.8	5W	750V	1000	0.1Ω–1MΩ
M07	54±1	8.5±1.0	38±3	0.8	7W	750V	1000	0.1Ω–1MΩ



CARBON FILM RESISTORS

TYPE
R08, R-25
R-50, R-100, R-200

- Power dissipations of ⅛, ¼, ½, 1W, 2W
- Available in Tape/Reel, Tape/Box and Bulk

ELECTRICAL SPECIFICATIONS

All measurements are taken at +25° at 1KHz and 65% relative humidity, unless otherwise stated.

INTRODUCTION

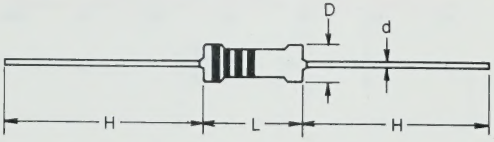
Billions of products are already in use worldwide in all types of applications—from process control instrumentation to telephone receivers and FM radio to color television.

The secret is in a proprietary production system and baking by a uniquely designed and automated production technique. Years of experience in making raw materials and production machinery prove the unique quality and high reliability of these products. They meet—or far exceed—such specifications as EIA RS196A, JIS-C-6402 and IEC-115.

FEATURES

- Industry's lowest cost!
- Delivery from stock in bulk, taped, and strip pack!
- Exceptional long-term stability
- Exceeds carbon comp MIL-R-11 performance
- Standard tolerances: ±2.%, ±5.% (±1.% available)
- Variety of packaging—bulk, strip pack, 26mm and 52mm tape and reel, cut and formed, or radial Panasert/Avisert

DIMENSIONS (mm)



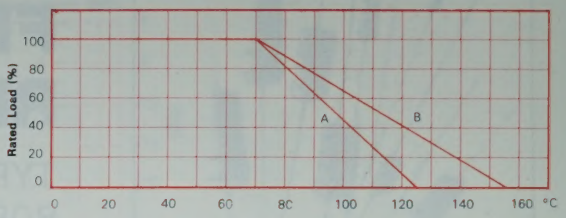
GENERAL SPECIFICATIONS

TYPE	DIMENSION (mm)				POWER RATING	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	RESISTANCE RANGE	
	L	D	H	d				+-2%(G)	+-5%(J)
R 08	3,8±0.2	1.5±0.2	28±2	0.45	1/8W	200	400	10Ω—470K	1Ω—4.7M
R 25	6.5±0.5	2.3±0.3	28±2	0.60	1/4W	250	500	1Ω—10M	0.5Ω—22M
R 50	9.5±0.5	3.2±0.5	28±2	0.60	1/2W	350	700	1Ω—10M	0.5Ω—22M
R 100	12±1.0	4.5±0.5	37±3	0.80	1W	500	1000	1Ω—10M	0.5Ω—22M
R 200	16±1.0	5.5±0.5	37±3	0.80	2W	500	1000	1Ω—10M	0.5Ω—22M

CHARACTERISTICS

Terminal Strength	no damage. △ Rmax ±0.3% or 0.5Ω
Soldering	good tining no damage, △ Rmax ±0.5% or 0.5Ω
Temperature Cycling	△ Rmax ±0.5%
Vibration	no damage △ Rmax ±0.5% or 0.5Ω
Moisture Resistance	△ Rmax ±3% See Fig-1
Load Life	△ Rmax. ±2.5% See Fig-2
Temperature Coefficient	See Fig-4
Dielectric Strength	2x Work. Volt no breakdown △ Rmax. 0.5%
Noise	See Fig. 5
Insulation Resistance	min $10^{10}\Omega$
Short-time Overload	△ Rmax. ±0.5%
Voltage Coefficient	< 5 ppm
Resistance to Solvents	no damage

FIG. 3 Derating Curve



The curve B is for R08, R25, R50

The curve A is for R100, R200

FIG. 4 Temperature Coefficient

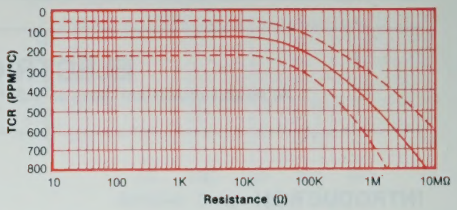


FIG. 5 Current Noise

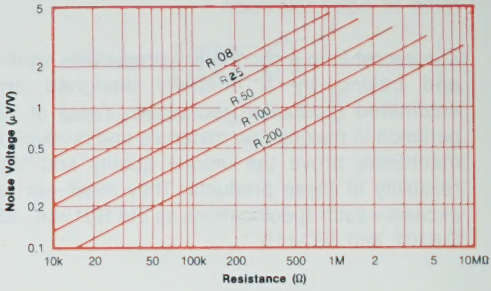


FIG. 1 Moisture Resistance

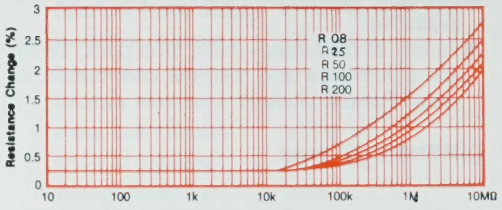


FIG. 2 Load Life

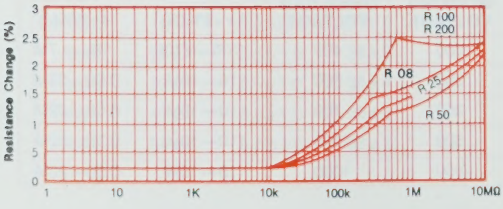
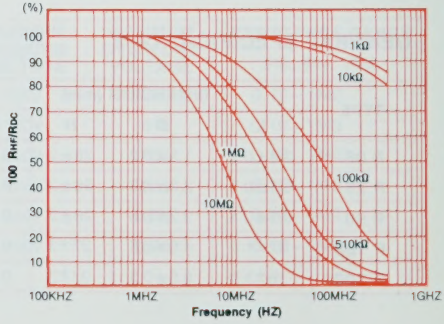
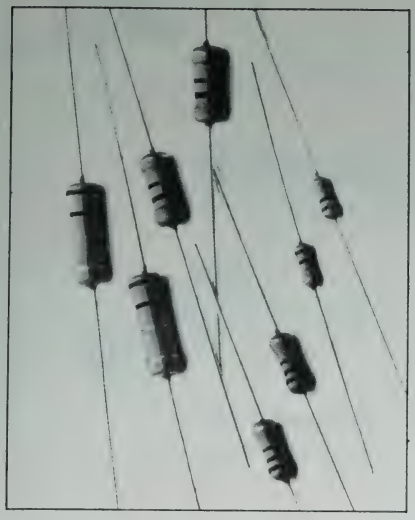


FIG. 6 High Frequency Characteristic





CARBON FILM RESISTORS

FLAME-PROOF TYPE
FR 25, FR 50, FR 100
FR 200

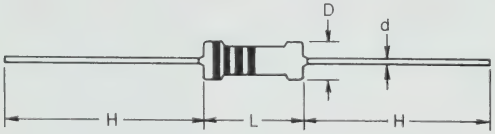
INTRODUCTION

The FR Series Flame-Proof Carbon Film Resistors are manufactured by Coating a homogeneous film of pure carbon on high grade ceramic rods, resistance less than 10Ω have an electroless-deposited nicket film, and are coated with layers of tan color flame-proof lacquer. These resistors meet overload tests in accordance with UL specification #1412 without producing a fire hazard.

FEATURES

- Low cost, prompt delivery
- High power-to-size ratio for significant space savings
- Excellent long-term stability
- Complete flameproof construction
- Wide resistance range: 0.5Ω—10MΩ
- standard tolerance: ±2%, ±5% (consult factory for 1%)
- Coating and marking resist Trichlorethelyne, Freon, and other cleaning agents.

DIMENSIONS (mm)



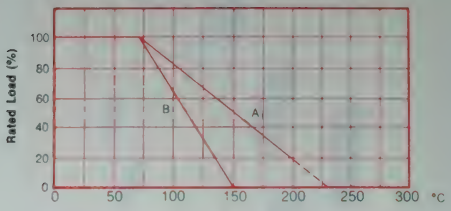
GENERAL SPECIFICATIONS

TYPE	DIMENSION (mm)				POWER RATING	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	RESISTANCE RANGE	
	L	D	H	d				+-2%(G)	+-5%(J)
FR 25	6.5±0.5	2.3±0.3	28±2	0.60	1/4W	250	500	1Ω—4.7M	0.5Ω—10M
FR 50	9.5±0.5	3.2±0.5	28±2	0.60	1/2W	350	700	1Ω—4.7M	0.5Ω—10M
FR 100	12.0±1.0	4.5±0.5	37±3	0.80	1W	500	1000	1Ω—4.7M	0.5Ω—10M
FR 200	16.0±1.0	5.5±0.5	37±3	0.80	2W	500	1000	1Ω—4.7M	0.5Ω—10M

CHARACTERISTICS

Terminal Strength	no damage. △ Rmax ±0.5% or 0.5Ω
Soldering	good tining no damage, △ Rmax ±0.5% or 0.5Ω
Temperature Cycling	△ Rmax ±1%
Vibration	no damage △ Rmax ±0.5% or 0.5Ω
Moisture Resistance	△ Rmax. 5%
Load Life	△ Rmax. 3%
Temperature Coefficient	See Fig. 4
Dielectric Strength	2x Work. Volt no breakdown △ Rmax. 0.5%
Noise	See Fig 5
Insulation Resistance	min $10^{10}\Omega$
Short-time Overload	△ Rmax. 1%
Voltage Coefficient	< 5 ppm
Resistance to Solvents	no damage

FIG. 3 Derating Curve



The curve B is for FR-12, FR-25, FR-50

The curve A is for FR-100, FR-200

FIG. 4 Temperature Coefficient

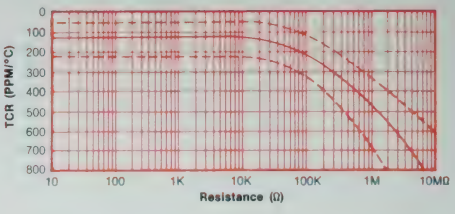


FIG. 5 Current Noise

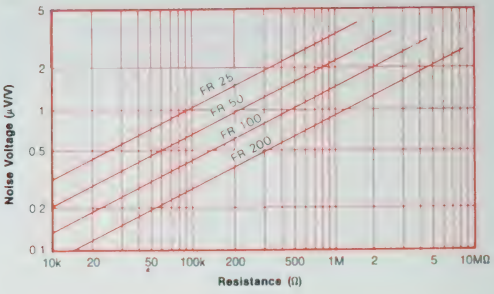


FIG. 1 Moisture Resistance

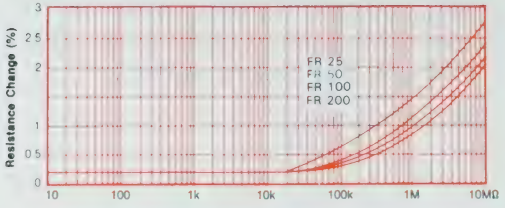


FIG. 2 Load Life

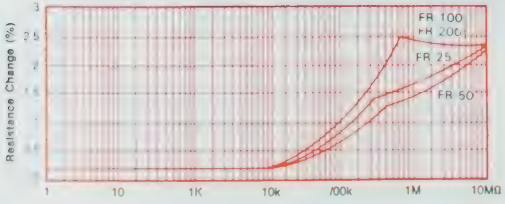
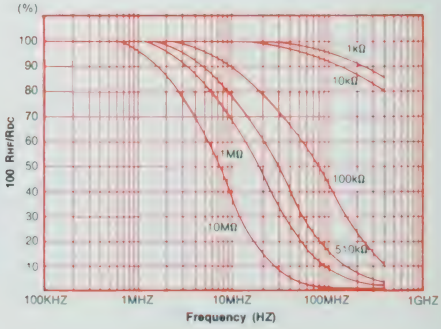
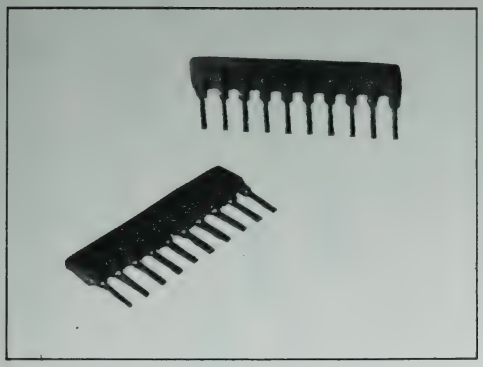


FIG. 6 High Frequency Characteristic





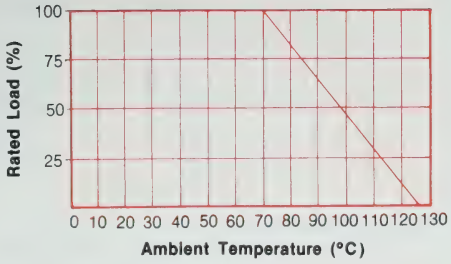
THICK FILM RESISTOR NETWORKS

SINGLE IN-LINE SIP RESISTORS

INTRODUCTION

These confomal coated single-in-line (SIP) resistor networks are designed to meet a variety of application requirements in a compact, highly reliable package.
All SIP networks are quality tested for both resistance and tolerance before shipping.
Applications for resistor networks include: pull up and pull down resistors, TTL & ECL line terminating resistors, LED current limiting resistors and telecommunication networks.

DERATING CURVE



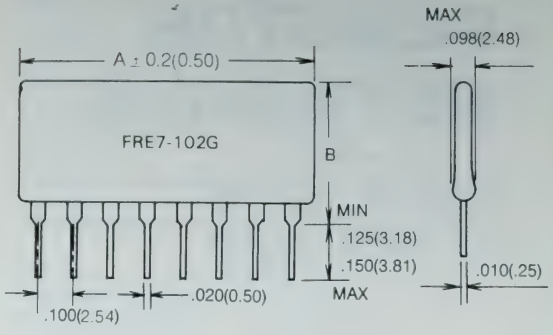
FEATURES

- Substrate Material-96% alumina provides superior thermal properties and cooler operation.
- Resistors and Conductors-thick film materials with proven reliable performance.
- Lead Pull Strength: 5 lbs.
- Lend Material: Tinned platted copper alloy
- Provides high electrical conductivity and thermal transfer.
- Encapsulation: Conformal coating ensure reliable performance.

PERFORMANCE SPECIFICATIONS

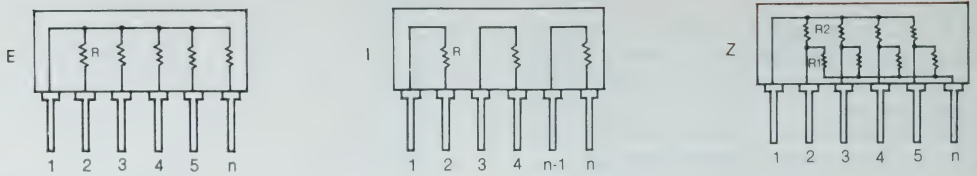
Temperature Coefficient	±200PPM Std., ±100PPM avail.
TCR Tracking	50PPM Max.
Operating Temperature	-55°C to +125°C
Max. Working Voltage	200V
Thermal Shock	±.5% Max
Moisture Resistance	±.5% Max
Terminal Strength	±.25% Max
Resis. to Soldering Heat	±.25% Max
Load Life (1000 hours)	±1.0% Max
Temperature Cycling	±0.5% Max
Shock and Vibration	±.25% Max
Solvent Resistance	Resists industrial cleaning agents per MIL-STD-202E
Lead Solderability	Meets MIL-STD-202 Method 208

DIMENSIONS



	No. Pins	STD circuit E	STD circuit I	STD circuit Z	Dimensions mm	Dimensions in.
A	5	4	—	—	12.57	.495
	6	5	3	8	15.11	.595
	7	6	—	—	17.65	.695
	8	7	4	12	20.19	.795
	9	8	—	14	22.73	.895
	10	9	5	16	25.27	.995
	11	10	—	—	27.81	1.095
	12	11	6	—	30.35	1.195
	13	12	—	—	32.89	1.295
B	Low Profile				5.08	.200
	Medium Profile				6.35	.250
	High Profile				8.90	.350

STANDARD CIRCUITS



PART NUMBERING

V 8 X 102 G

- **V** — SINGLE IN-LINE RESISTOR NETWORK
  - V = Low profile
  - S = Medium profile
  - R = High profile
- **8** — NO OF ELEMENTS
- **X** — CIRCUIT TYPE
  - E = Edge common
  - I = Isolate
  - Z = Double Termination
- **102** — RESISTANCE CODE
  First two digits are significant. Last digit specifies number of zeros.
- **G** — RESISTANCE TOLERANCE
  - G = ±2%
  - J = ±5%
  - K = ±10%
  - M = ±20%

POWER RATING

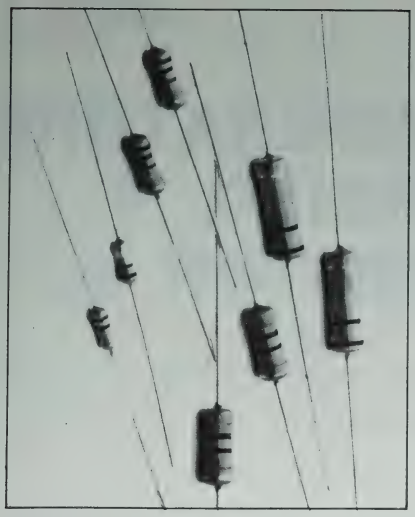
Profile	Circuit: E Parallel	Circuit: I Discrete	Circuit: Z Double Termination
Low	.125W	.200W	.200W ($R_1 + R_2$)
Medium	.150W	.250W	.250W ($R_1 + R_2$)
High	.250W	.350W	.350W ($R_1 + R_2$)

STANDARD RESISTANCE (Ω)

33	220	1K	5.6K	47K
47	270	1.2K	6.2K	68K
56	330	1.5K	6.8K	82K
68	390	1.8K	8.2K	100K
82	470	2.2K	10K	220K
100	510	2.7K	12K	390K
120	560	3.3K	15K	470K
150	680	3.9K	22K	680K
180	820	4.7K	33K	1M

DOUBLE TERMINATION (R1/R2) (Ω)

81/130
120/195
160/260
220/270
180/390
220/330
330/390
330/470
3K/6.2K



HIGH-MEG OHM CERMET GLAZE RESISTORS

TYPE-HMG 25, HMG 50
HMG 100, HMG 200
RESISTANCE UP TO 1000MΩ

INTRODUCTION

The Type HMG resistors are suited for high voltage and high impedance applications where high resistance and stability are required.

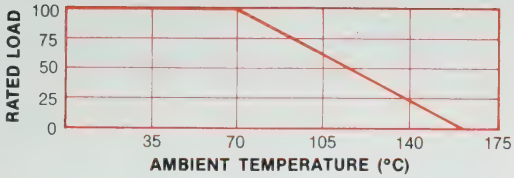
Consistent quality and reliability is achieved by thick film construction on high-grade ceramic core. Multilayer epoxy coating offers exceptional environmental protection.

HMG resistors are particularly suited in voltage dividers, X-ray equipment, and high voltage power supplies.

FEATURES

- Low cost, high stability
- Standard tolerances: ±2%, ±5%
- Standard TCR ±350 PPM (200 PPM available)
- Standard Resistance to 1000 MegΩ.

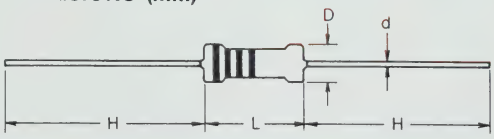
DERATING CURVE



PERFORMANCE (MAX △R)

Temperature Cycling	±0.5%
Load Life 1000 Hours	±2.0%
Shelf Life at 25°C	±1.0% (12 months)
Effect of Soldering	±1.0%
Moisture Resistance	±2.0%
Short-Time Overload	±1.0%

DIMESIONS (mm)



TYPE	DIMENSION (mm)				POWER RATING	MAXIMUM WORKING VOLTAGE	MAXIMUM OVERLOAD VOLTAGE	RESISTANCE RANGE	
	L	D	H	d				+-2%(G)	+-5%(J)
HMG 25	6.5±0.5	2.3±0.3	28±2	0.60	1/4W	250	500	1M— 22MΩ	1M— 100MΩ
HMG 50	9.5±0.5	3.2±0.3	28±2	0.60	1/2W	500	1000	1M— 22MΩ	1M— 200MΩ
HMG 100	12.0±1.0	4.5±0.5	37±3	0.80	1W	750	1500	1M—100MΩ	1M— 500MΩ
HMG 200	16.0±1.0	5.0±0.5	37±3	0.80	2W	1000	2000	1M—100MΩ	1M—1000MΩ

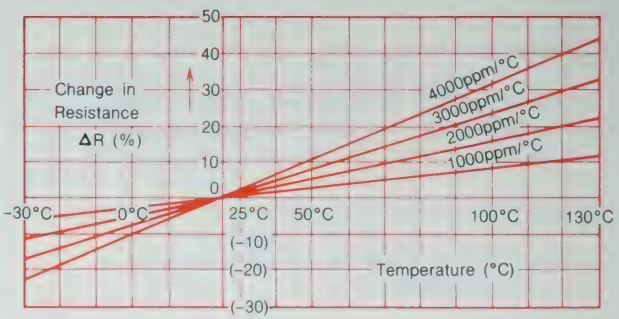
TEMPERATURE SENSING RESISTOR

TYPE-TSR 25
LINEAR TCR UP TO 5000PPM/°C

INTRODUCTION

The type TSR temperature sensing resistors are designed for low cost temperature sensing device, specially in the circuits as temperature compensation, temperature detection, thermal protection, thermal control and liquid level detection.

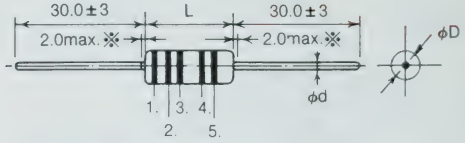
TCR CURVE



FEATURES

Wide Resistance Range: 1Ω—10K
Resistance Tolerance: 5%, 10%, 20%
Operating Temperature: -55°C to +145°C
TCR: 1000—5000PPM/°C

DIMENSIONS (mm)



1,2 Resistance Significant
3 Resistance Multiplien
4,5 TCR Significant Multiple By 100

GENERAL SPECIFICATION

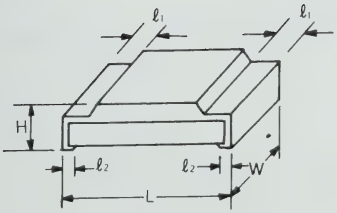
Style	Rating Power	Resistance Range	TCR	Resistance Code	TCR Code	Resistance Tolerance	TCR Tolerance	Dimension		
								L	D	d
TSR 25	0.25W (1/4W)	1.0Ω—43Ω 43Ω—4.3KΩ 4.3KΩ—10KΩ	1,000—5,100ppm/°C 1,800—3,900ppm/°C 1,800—2,400ppm/°C	E-24	E-12	± 5% ±10%	±10°	6.35 +0.65 -0.35	2.3 +0.5 -0.3	0.60 ±0.05

CHIP RESISTORS

TYPE CR32, CR21

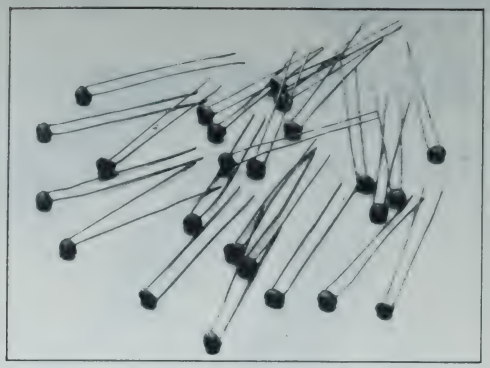
SPECIFICATION

RESISTANCE RANGE		10Ω—1MΩ
TEMP. RANGE		−55°C~125°C
TEMP COEFFICIENT	AMB TEMP +100°C	≤ 100Ω±500PPM/°C > 100Ω±300PPM/°C
TEMP. CYCLING	−55°C~125°C	±1% +0.2Ω
SHORT TIME OVER LOAD	RATED V x 2.5, 5sec.	±2% +0.05Ω
MOISTURE	40°C, RH90—95%	±3% +0.1Ω
LOAD LIFE	70°C	±3% +0.1Ω
TERMINAL STRENGTH	1kg 10sec	±1% +0.1Ω
SOLDERING	230°C 5sec.	> 95%
SOLDERING HEAT	270°C 10sec.	±1% +0.05Ω



Type	Wattage	L(mm)	W(mm)	H(mm)	ℓ1(mm)	ℓ2(mm)
CR32	1/8W	3.2	1.6	0.55	0.45	0.25max.
CR21	1/10W	2.0	1.25	0.45	0.35	0.25max.

Packaging: Bulk, Taping, Magazine

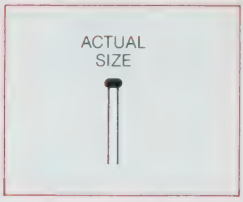


MICRO RESISTORS

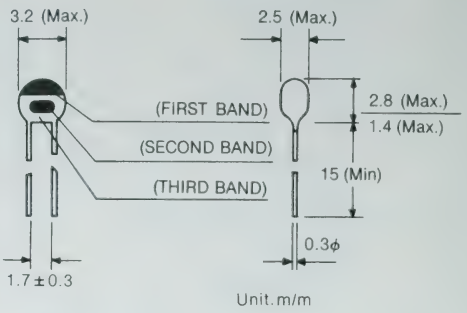
TYPE MR 07

FEATURES

- 1/16 watt dissipation in miniature size
- Radial leads for reduced mounting space
- Cermet glaze, thick-film construction for superior stability and reliability
- Multilayer expoxy coating for complete protection
- Extremely wide resistance range



MARKING AND DIMENSIONS

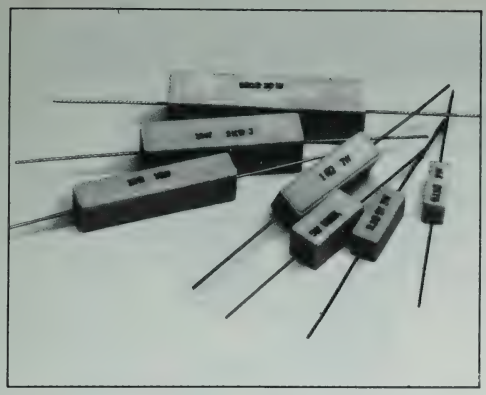


Unit.m/m

Resistance value is indicated by color coding in two dots and body color. Marking of standard tolerance is eliminated.

SPECIFICATIONS

RESISTANCE RANGE	**5.1Ω—100KΩ (±5%)** **110KΩ—910KΩ (±10%)** **1MΩ—2,000MΩ (±20%)**
RATED POWER	0.07W (1/16W)
MAX WORKING VOLTAGE	100V
WORKING TEMPERATURE RANGE	−40°C~125°C
NOISE LEVEL	MAX. 10μV/V
TEMPERATURE COEFFICIENT	±500PPM/°C
LOAD LIFE TEST	±5%
DAMP HEAT	±10%
SOLDERING HEAT RESISTANCE	±(1%+0.05Ω)

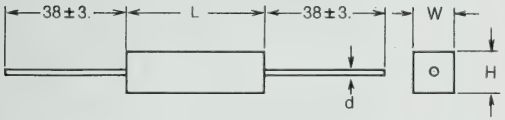


WIREWOUND RESISTORS RECTANGULAR

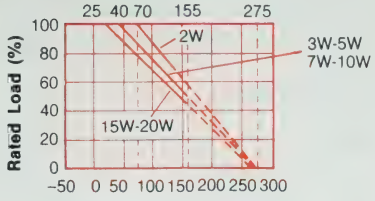
AXIAL LEAD TYPE
SQ (STANDARD TYPE)
NSQ (NON-INDUCTIVE TYPE)

FEATURES

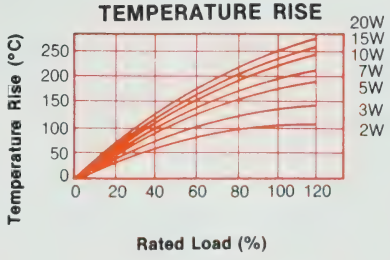
1. Exceptionally small and sturdy; mechanically safe. Excellent electrical characteristics.
2. The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistance as well as self-extinguishing capabilities. They will withstand the most rigorous loading test.
3. As resistors in radio and television receivers, the hazardous conditions of smoking and redheat can be completely prevented by the proper choice of power resistors.
4. Tolerances of 5% and 10% are standard.
5. Applicable specifications: EIA RS-344 and EIA RC-649.



DERATING CURVE



TEMPERATURE RISE

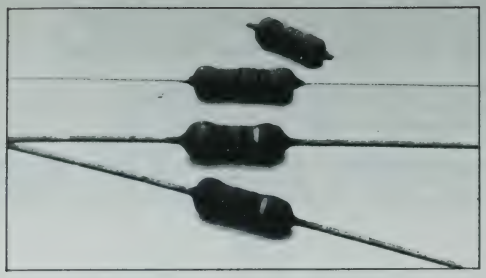


TYPE	RATED (WATTS)	DIMENSIONS (mm)				RANGE (OHM)
		L±0.5	W±0.5	H±0.5	d±0.02	
SQ 2	2W	18.0	7	7	0.8	0.15- 200
SQ 3	3W	22.0	8.0	8.0	0.8	0.30- 500
SQ 5	5W	22.0	10	9	0.8	0.30-2000
SQ 7	7W	35.0	10	9	0.8	0.50-2500
SQ 10	10W	48.0	10	9	0.8	1.0 -3000
SQ 15	15W	48.0	12.5	11.5	0.9	1.0 -3000
SQ 20	20W	60	14.5	13.5	0.9	1.0 -3500

NOTE: Non-Inductive type upto 50Ω

PERFORMANCE

Temperature Coefficient	±300 PPM/°C
Insulation Resistance	> 100 MΩ
Load Life (1,000 hours)	±5% +0.05Ω
Short-time Overload	±2% +0.05Ω
Dielectric Withstanding Volt	±2% +0.05Ω
Moisture Resistance	±5% +0.05Ω
Shock and Vibration	±1% +0.05Ω
Effect of Soldering	±2% +0.05Ω



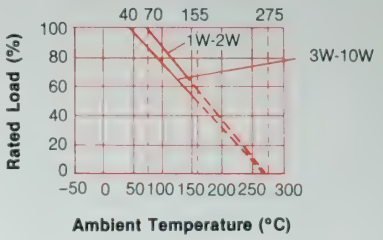
WIREWOUND RESISTORS

FLAME-PROOF COATING TYPE
KNP (STANDARD TYPE)
NKNP (NON-INDUCTIVE TYPE)

FEATURE

1. The resistor is fabricated using a suitable fiberglass or ceramic core with the resistanoe wire securely crimped to the terminals.
2. Small in size comparatively than other kind resistor.
3. Electrical and mechanical stability and high reliability.
4. Tolerance of 5%, 10% are standard.

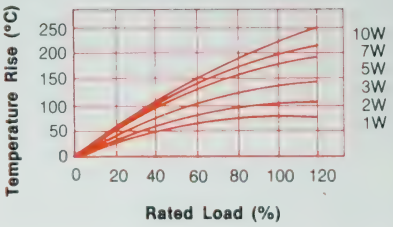
DERATING CURVE



PERFORMANCE

Temperature Coefficient	±300 PPM/°C
Insulation Resistance	> 100 MΩ
Load Life (1,000 hours)	±5% +0.05Ω
Short-time Overload	±2% +0.05Ω
Dielectric Withstanding Volt	±2% +0.05Ω
Moisture Resistance	±5% +0.05Ω
Shock and Vibration	±1% +0.05Ω
Effect of Soldering	±2% +0.05Ω

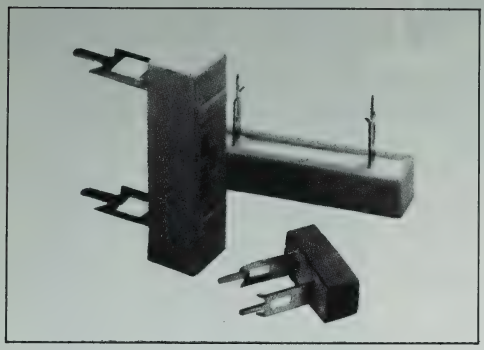
TEMPERATURE RISE



DIMENSIONS

TYPE	RATED WATTS	DIMENSIONS (mm)				Resistance range (Ω)
		D	L	H	d	
KNP 1W	1W	4.0	11	38	0.6	0.1–50
KNP 2W	2W	5.0	15	38	0.8	0.1–100
KNP 3W	3W	6	17	38	0.8	0.1–130
KNP 4W	4W	8	24	38	0.8	0.1—300
KNP 5W	5W	8	24	38	0.8	0.1—400
KNP 6W	6W	8	29	38	0.8	0.1—500
KNP 7W	7W	8	34	38	0.8	0.1–560
KNP 8W	8W	8	39	38	0.8	0.1–700
KNP 10W	10W	8	52	38	0.8	0.1–820

Note: Resistance up to 50Ω maximum for Non-Inductive type



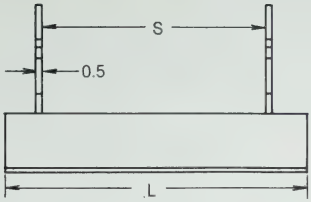
WIREWOUND RESISTORS

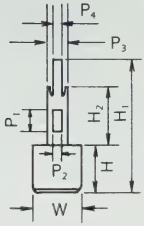
RECTANGULAR
PCB MOUNTING TYPE
SQZ (STANDARD TYPE)
NSQZ (NON-INDUCTIVE TYPE)

FEATURE

1. Space saving stand-off type
2. Non-Inductive type up to 50Ω available
3. Tolerance: 5%, 10%
4. Complete unflamable.

DIMENSIONS





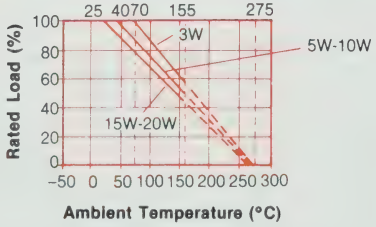
Description	Power Rating (W)	Range of Resistance (Ω)	Dimensions (mm)									
			L	H	W	S	H1	H2	P1	P2	P3	P4
SQZ 5	5	0.1—400	27.0	9.5	9.5	15.0	24.0	9.5	4.0	2.0	5.0	1.4
SQZ 7	7	0.1—600	35.0	9.5	9.5	22.5	24.0	9.5	4.0	2.0	5.0	1.4
SQZ 10	10	0.1—800	48.0	9.5	9.5	35.0	24.0	9.5	4.0	2.0	5.0	1.4
SQZ 15	15	0.1—800	48.0	12.5	12.5	32.5	34.5	15.0	7.0	6.0	10.0	2.7
SQZ 20	20	0.5—1K	63.5	12.5	12.5	50.0	34.5	15.0	7.0	6.0	10.0	2.7
SQZ 3S	3	0.1—300	22.0	8.0	8.0	10.0	23.0	12.0	4.0	2.0	5.0	1.4
SQZ 5S	5	0.1—300	22.0	9.5	9.5	10.0	24.0	12.0	4.0	2.0	5.0	1.4

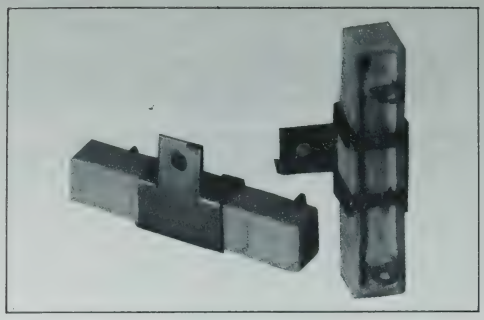
Note: Resistance up to 50Ω maximum for Non-Inductive type

PERFORMANCE

Temperature Coefficient	±300 PPM/°C
Insulation Resistance	100 MΩ
Load Life (1,000 hours)	±5% + 0.05Ω
Short-time Overload	±2% + 0.05Ω
Dielectric withstanding volt	±2% + 0.05Ω
Moisture resistance	±5% + 0.05Ω
Shock and Vibration	±1% + 0.05Ω
Effect of Soldering	±2% + 0.05Ω

POWER DERATING CURVE





WIREWOUND RESISTORS

RECTANGULAR
CLAMP MOUNTING TYPE
SQH (STANDARD TYPE)
NSQH (NON-INDUCTIVE TYPE)

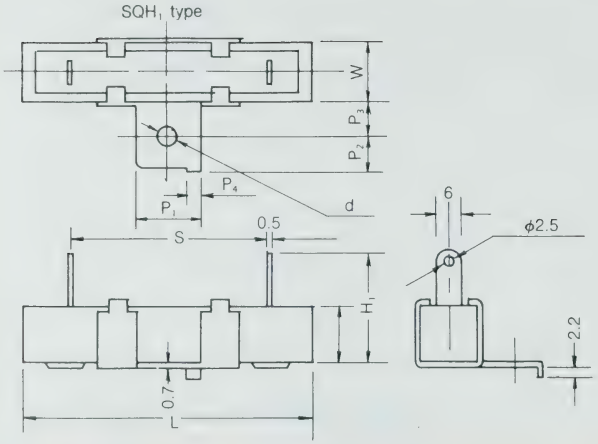
FEATURE

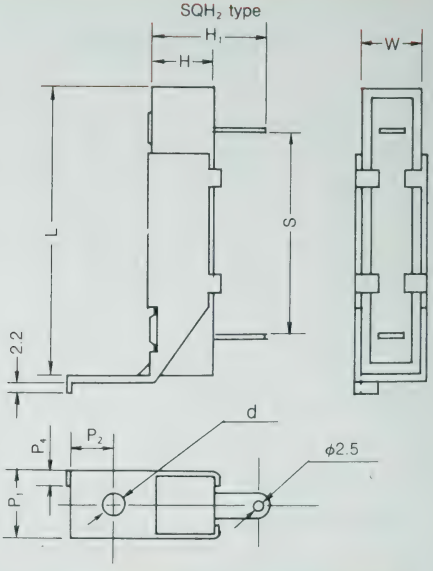
1. Low Cost
2. Small size, High power capacity.
3. Non-Inductive type up to 50Ω available
4. Tolerance: 5%, 10%.
5. Complete unflamable.

PERFORMANCE*

Temperature Coefficient	±300 PPM/°C
Insulation Resistance	> 100 MΩ
Load Life (1,000 hours)	±5% +0.05Ω
Short-time Overload	±2% +0.05Ω
Dielectric Withstanding Volt	±2% +0.05Ω
Moisture Resistance	±5% +0.05Ω
Shock and Vibration	±1% +0.05Ω
Effect of Soldering	±2% +0.05Ω

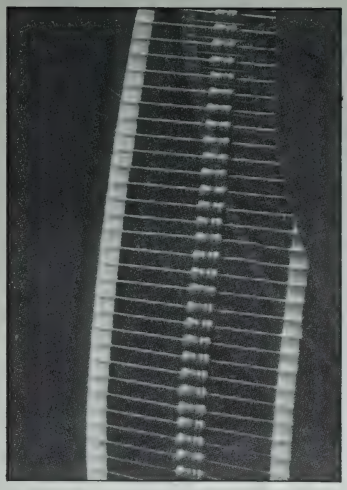
DIMENSIONS





Type	Power Rating (W)	Range of Resistance (Ω)	Dimensions (mm)									
			L	H	W	S	H1	P1	P2	P3	P4	d
SQH 10	10	0.1—800	48.0	10.5	10.5	33	19.5	11	6	5.8	2.5	3.8
SQH 15	15	0.1—800	48.0	12.5	12.0	33	20.5	11	6	6.5	3.0	3.8
SQH 20	20	0.1—1K	63.5	12.5	12.0	48	20.5	11	6	6.5	3.0	3.8
SQH 30	30	0.5—1K	75.0	19.0	18.0	56	28.0	18	8	10.0	3.0	4.2
SQH 40	40	1.0—1.5K	90.0	19.0	18.0	71	28.0	18	8	10.0	3.0	4.2

*Resistance up to 50Ω maximum for Non-Inductive type



ZEROHM JUMPER WIRES

- Similar to a ¼ Watt resistor (1/8W Size also avail)
- Ideal for automatic insertion or cut and form
- Available in Tape/Reel, Tape/Box (Ammo Pak) and Bulk

ELECTRICAL SPECIFICATIONS

APPLICATION

Jumper wires or crossovers, as they are sometimes called, are basically interconnection devices between points on a P.C. Board.

Generally they are used for the following reasons:

- Inability to connect two points on a P.C. Board due to other circuit paths which must be crossed over.
- An After-the-Fact design change that requires new point connections.
- Circuit tuning by changing point connections.

Jumper wires offers a quick simple solution to these problems. They are especially suited for automatic machine insertion on lead tape or available in all packaging styles including precut and formed leads for manual insertion.

SPECIFICATIONS

Maximum Resistance 0.005Ω

Lead Material ..... tin-plated copper

Body Material ..... electrical grade, high performance molding compound

Min. Insulation Resistance: Dry ... 10,000 megΩ
Wet ..... 100 megΩ

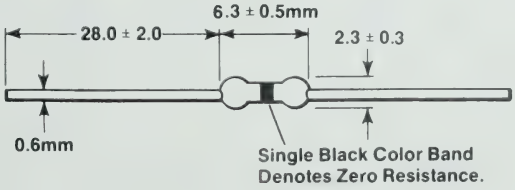
Min. Dielectric Withstanding Voltage:
Atmospheric ..... 500V RMS
Reduced ..... 325V RMS

Insulation Flammability ..... resistor insulation is self extinguishing within 10 seconds after externally applied flame is removed.

Current Rating ..... 25 AMPS at 25°C derating to 0 Amps at 150°C

Packaging ..... Tape/Reel - 5,000 pcs.
Tape/Box - 1,000 pcs.
Bulk - 1,000 pcs. (200 per bag)

DIMENSIONS

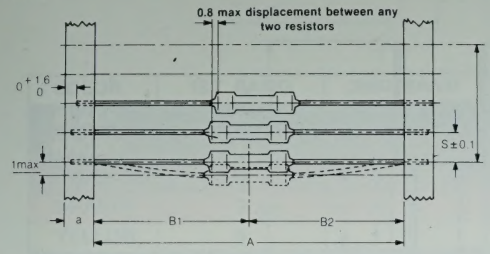


Conversion table mm - inches

mm	inches	mm	inches	mm	inches	mm	inches
0.5	0.01968	**25.5**	1.00393	**50.5**	1.98818	**75.5**	2.97244
1.0	0.03937	**26.0**	1.02362	**51.0**	2.00787	**76.0**	2.99212
1.5	0.05905	**26.5**	1.04330	**51.5**	2.02755	**76.5**	3.01181
2.0	0.07874	**27.0**	1.06299	**52.0**	2.04724	**77.0**	3.03149
2.5	0.09842	**27.5**	1.08267	**52.5**	2.06692	**77.5**	3.05118
3.0	0.11811	**28.0**	1.10236	**53.0**	2.08661	**78.0**	3.07086
3.5	0.13779	**28.5**	1.12204	**53.5**	2.10629	**78.5**	3.09055
4.0	0.15748	**29.0**	1,14173	**54.0**	2.12598	**79.0**	3.11023
4.5	0 17716	**29.5**	1.16141	**54.5**	2.14566	**79.5**	3.12992
5.0	0.19685	**30.0**	1.18110	**55.0**	2.16535	**80.0**	3.14960
5.5	0.21653	**30.5**	1.20078	**55.5**	2.18503	**80.5**	3.16929
6.0	0.23622	**31.0**	1.22047	**56.0**	2.20472	**81.0**	3.18897
6.5	0.25590	**31.5**	1.24015	**56.5**	2.22440	**81.5**	3.20866
7.0	0.27559	**32.0**	1.25984	**57.0**	2.24409	**82.0**	3.22834
7.5	0.29527	**32.5**	1.27952	**57.5**	2.26377	**82.5**	3.24803
8.0	0.31496	**33.0**	1.29921	**58.0**	2.28346	**83.0**	3.26771
8.5	0.33464	**33.5**	1.31889	**58.5**	2.30314	**83.5**	3.28740
9.0	0.35433	**34.0**	1.33858	**59.0**	2.32283	**84.0**	3.30708
9.5	0.37401	**34.5**	1.35826	**59.5**	2.34251	**84.5**	3.32677
10.0	0.39370	**35.0**	1.37795	**60.0**	2.36220	**85.0**	3.34645
10.5	0.41338	**35.5**	1.39763	**60.5**	2.38188	**85.5**	3.36614
11.0	0.43307	**36.0**	1.41732	**61.0**	2.40157	**86.0**	3.38582
11.5	0.45275	**36.5**	1.43700	**61.5**	2.42125	**86.5**	3.40551
12.0	0.47244	**37.0**	1.45669	**62.0**	2.44094	**87.0**	3.42519
12.5	0.49212	**37.5**	1.47637	**62.5**	2.46062	**87.5**	3.44488
13.0	0.51181	**38.0**	1.49606	**63.0**	2.48031	**88.0**	3.46456
13.5	0.53149	**38.5**	1.51574	**63.5**	2.49999	**88.5**	3.48425
14.0	0.55118	**39.0**	1.53543	**64.0**	2.51968	**89.0**	3.50393
14.5	0.57086	**39.5**	1.55511	**64.5**	2.53937	**89.5**	3.52362
15.0	0.59055	**40.0**	1.57480	**65.0**	2.55905	**90.0**	3.54330
15.5	0.61023	**40.5**	1.59448	**65.5**	2.57874	**90.5**	3.56299
16.0	0.62992	**41.0**	1.61417	**66.0**	2.59842	**91.0**	3.58267
16.5	0.64960	**41.5**	1.63385	**66.5**	2.61811	**91.5**	3.60236
17.0	0.66929	**42.0**	1.65354	**67.0**	2.63779	**92.0**	3.62204
17.5	0.68897	**42.5**	1.67322	**67.5**	2.65748	**92.5**	3.64173
18.0	0.70866	**43.0**	1.69291	**68.0**	2.67716	**93.0**	3.66141
18.5	0.72834	**43.5**	1.71259	**68.5**	2.69685	**93.5**	3.68110
19.0	0.74803	**44.0**	1.73228	**69.0**	2.71653	**94.0**	3.70078
19.5	0.76771	**44.5**	1.75196	**69.5**	2.73622	**94.5**	3.72047
20.0	0.78740	**45.0**	1.77165	**70.0**	2.75590	**95.0**	3.74015
20.5	0.80708	**45.5**	1.79133	**70.5**	2.77559	**95.5**	3.75984
21.0	0.82677	**46.0**	1.81102	**71.0**	2.79527	**96.0**	3.77952
21.5	0.84645	**46.5**	1.83070	**71.5**	2.81496	**96.5**	3.79921
22.0	0.86614	**47.0**	1.85039	**72.0**	2.83464	**97.0**	3.81889
22.5	0.88582	**47.5**	1.87007	**72.5**	2.85433	**97.5**	3.83858
23.0	0.90551	**48.0**	1.88976	**73.0**	2.87401	**98.0**	3.85826
23.5	0.92519	**48.5**	1.90944	**73.5**	2.89370	**98.5**	3.87795
24.0	0.94488	**49.0**	1.92913	**74.0**	2.91338	**99.0**	3.89763
24.5	0.96456	**49.5**	1.94881	**74.5**	2.93307	**99.5**	3.91732
25.0	0.98425	**50.0**	1.96850	**75.0**	2.95275	**100.0**	3.93700

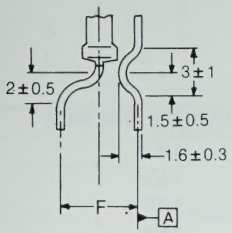
Bandolier for Axial leads

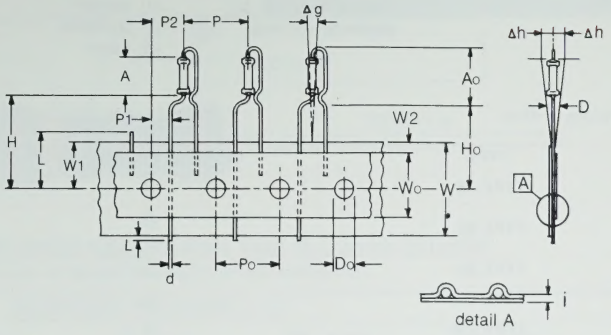
The resistors are supplied on bandolier; either 1000 resistors in ammopack or 5000 resistors on reel.



TYPE	a ±0.5	A ±1.5	B1-B2 ±max.	S (spacing)	T (max. deviation of spacing)
TYPE 12	6	52.5	1.2	5	1mm per 10 spacings 0.5mm per 5 spacings
TYPE 25	6	52.5	1.2	5	
		26.0	1.0		
TYPE 50	6	52.5	1.2	5	
TYPE 100	6	73.0	1.5	5	
TYPE 200	6	73.0	1.5	10	

Bandolier for Radial leads



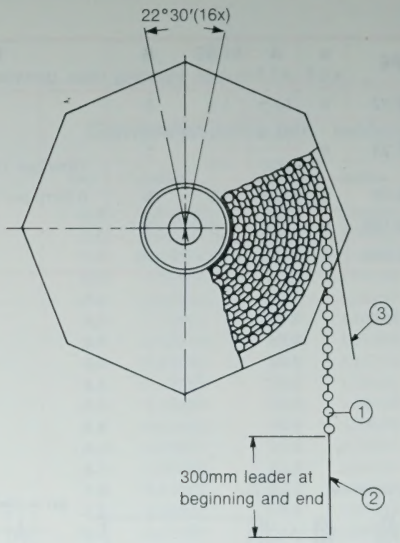


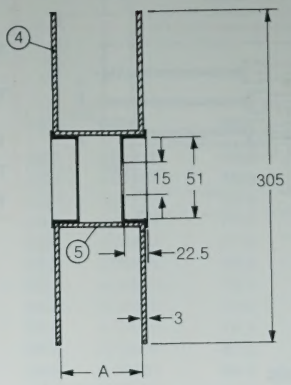
Body diameter	D	max.	2.50
Body length	A	max.	7.00
Mounting height	A_0	max.	12.50
Lead wire diameter	d		0.60±0.06
Pitch of components	P		12.7 ±1.0
Feed hole pitch	P_0		12.7 ±0.3
Maximum deviation of spacing	T		1.0 per 20 spacings 0.5 per 4 spacings
Feed hole centre to lead	P_1		3.85±0.5
Feed hole centre to body	P_2		6.35±0.4
Lead to lead distance	F		5.08 + 0.6 – 0.2
Component alignment	Δh		0 ±2mm
Component alignment	Δg		0 ±3°
Tape width	W		18.0 ±1 – 0.8
Hold down tape width	W_0	min.	12.5 or 6mm
Hole position	W_1		9.0 ±0.5
Hold down tape position	W_2		2 ±0 – 1.5
Distance component to tape centre	H		19.0 ±1
Lead wire clinch height	H_0		16.5 ±0.5
Lead wire protrusion	l	max.	0
Feed hole diameter	D_0		4.0 ±0.2
Total tape thickness	i	max.	0.7
Length of snipped lead	L	max.	11.0

Extraction force for components in the tape plane, vertically to the direction of unreeling: 5N.

TAPE ON REEL PACKING

Bandoliers can be reeled; dimensions A differ per type.





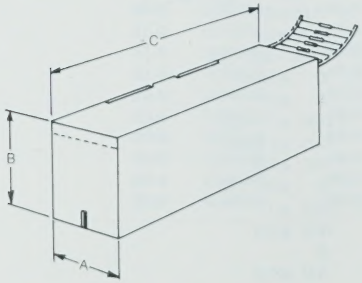
(1) resistor
(2) bandolier
(3) paper
(4) flange
(5) cylinder

Dimensions in (mm)

TYPE	ACROSS FLANGE (A)	QUANTITY PER REEL (PCS)
TYPE 08	72	5,000
TYPE 25	48 72	5,000 5,000
TYPE 50	72	2,500
TYPE 100	95	2,000
TYPE 200	95	1,000

TAPE ON BOX PACKING

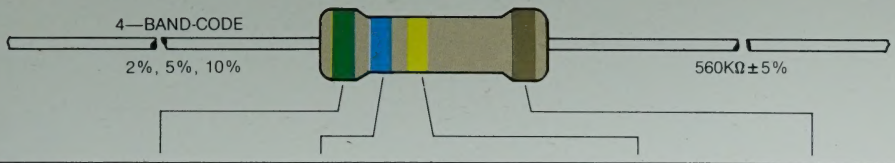
Bandoliers may also be supplied concertinaed in a cardboard box ("ammopack").



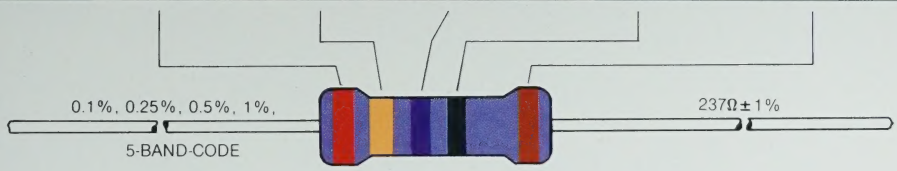
Dimensions in (mm)

TYPE	W (A)	H (B)	L (C)	QUANTITY PER BOX
TYPE 08	78	20	264	2000 pcs
TYPE 25	78	20	264	1000 pcs
TYPE 50	78	46	264	1000 pcs
TYPE 100	103	70	265	1000 pcs
TYPE 200	103	85	265	1000 pcs

"Ammopack" is an abbreviation of "ammunition packing".
The dimensions A-B-C vary per type and quantity.



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIEN	TOLERANCE
BLACK	0	0	0	1Ω	
BROWN	1	1	1	10Ω	± 1% (F)
RED	2	2	2	100Ω	± 2% (G)
ORANGE	3	3	3	1KΩ	
YELLOW	4	4	4	10KΩ	
GREEN	5	5	5	100KΩ	± 0.5% (D)
BLUE	6	6	6	1MΩ	±0.25% (C)
VIOLET	7	7	7	10MΩ	±0.10% (B)
GREY	8	8	8		±0.05%
WHITE	9	9	9		
GOLD				0.1	± 5% (J)
SILVER				0.01	± 10% (K)



STANDARD RESISTANCE VALUES FOR THE 10-TO-100 DECADE

(also usable in decade multiples or sub-multiples)

RESISTANCE TOLERANCE (±%)																		
0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%	0.1% 0.25% 0.5%	1%	2% 5% 10%
10.0	10.0	10	14.7	14.7	—	21.5	21.5	—	31.6	31.6	—	46.4	46.4	—	68.1	68.1	68
10.1	—	—	14.9	—	—	21.8	—	—	32.0	—	—	47.0	—	47	69.0	—	—
10.2	10.2	—	15.0	15.0	15	22.1	22.1	22	32.4	32.4	—	47.5	47.5	—	69.8	69.8	—
10.4	—	—	15.2	—	—	22.3	—	—	32.8	—	—	48.1	—	—	70.6	—	—
10.5	10.5	—	15.4	15.4	—	22.6	22.6	—	33.2	33.2	33	48.7	48.7	—	71.5	71.5	—
10.6	—	—	15.6	—	—	22.9	—	—	33.6	—	—	49.3	—	—	72.3	—	—
10.7	10.7	—	15.8	15.8	—	23.2	23.2	—	34.0	34.0	—	49.9	49.9	—	73.2	73.2	—
10.9	—	—	16.0	—	16	23.4	—	—	34.4	—	—	50.5	—	—	74.1	—	—
11.0	11.0	11	16.2	16.2	—	23.7	23.7	—	34.8	34.8	—	51.1	51.1	51	75.0	75.0	75
11.1	—	—	16.4	—	—	24.0	—	24	35.2	—	—	51.7	—	—	75.9	—	—
11.3	11.3	—	16.5	16.5	—	24.3	24.3	—	35.7	35.7	—	52.3	52.3	—	76.8	76.8	—
11.4	—	—	16.7	—	—	24.6	—	—	36.1	—	36	53.0	—	—	77.7	—	—
11.5	11.5	—	16.9	16.9	—	24.9	24.9	—	36.5	36.5	—	53.6	53.6	—	78.7	78.7	—
11.7	—	—	17.2	—	—	25.2	—	—	37.0	—	—	54.2	—	—	79.6	—	—
11.8	11.8	—	17.4	17.4	—	25.5	25.5	—	37.4	37.4	—	54.9	54.9	—	80.6	80.6	—
12.0	—	12	17.6	—	—	25.8	—	—	37.9	—	—	55.6	—	—	81.6	—	—
12.1	12.1	—	17.8	17.8	—	26.1	26.1	—	38.3	38.3	—	56.2	56.2	56	82.5	82.5	82
12.3	—	—	18.0	—	18	26.4	—	—	38.8	—	—	56.9	—	—	83.5	—	—
12.4	12.4	—	18.2	18.2	—	26.7	26.7	—	39.2	39.2	39	57.6	57.6	—	84.5	84.5	—
12.6	—	—	18.4	—	—	27.1	—	27	39.7	—	—	58.3	—	—	85.6	—	—
12.7	12.7	—	18.7	18.7	—	27.4	27.4	—	40.2	40.2	—	59.0	59.0	—	86.6	86.6	—
12.9	—	—	18.9	—	—	2.7	—	—	40.7	—	—	59.7	—	—	87.6	—	—
13.0	13.0	13	19.1	19.1	—	28.0	28.0	—	41.2	41.2	—	60.4	60.4	—	88.7	88.7	—
13.2	—	—	19.3	—	—	28.4	—	—	41.7	—	—	61.2	—	—	89.8	—	—
13.3	13.3	—	19.6	19.6	—	28.7	28.7	—	42.2	42.2	—	61.9	61.9	62	90.9	90.9	91
13.5	—	—	19.8	—	—	29.1	—	—	42.7	—	—	62.6	—	—	92.0	—	—
13.7	13.7	—	20.0	20.0	20	29.4	29.4	—	43.2	43.2	43	63.4	63.4	—	93.1	93.1	—
13.8	—	—	20.3	—	—	29.8	—	—	43.7	—	—	64.2	—	—	94.2	—	—
14.0	14.0	—	20.5	20.5	—	30.1	30.1	30	44.2	44.2	—	64.9	64.9	—	95.3	95.3	—
14.2	—	—	20.8	—	—	30.5	—	—	44.8	—	—	65.7	—	—	96.5	—	—
14.3	14.3	—	21.0	21.0	—	30.9	30.9	—	45.3	45.3	—	66.5	66.5	—	97.6	97.6	—
14.5	—	—	21.3	—	—	31.2	—	—	45.9	—	—	67.3	—	—	98.8	—	—
E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24	E-192	E-96	E-24

ORDERING INFORMATION

SAMPLE

R	25	G	104	J	T	01
(1)	(2)	(3)	(4)	(5)	(6)	(7)

1 — Series

2 — Wattage Designation

3 — Carbon film G used as a spacer metal film D(100PPM), C(50PPM), E(25PPM) specifies temperature coef.

4 — Ohmic value -5% & 2% use 3 digits 1% use 4 digits

5 — Tolerance- M-20, K-10, J-5, G-2, F-1, D-.5, C-.25, B-.1

6 — Packaging—B-Bulk, A-Ammo, T-Tape & Reel

7 — Special customer requirements

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